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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/826,304	04/19/2004	Shye-Lin Wu	BHT-3167-188	9813

7590 07/27/2005
BRUCE H. TROXELL
SUITE 1404
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FALLS CHURCH, VA 22041

EXAMINER

DICKEY, THOMAS L

ART UNIT PAPER NUMBER

2826

DATE MAILED: 07/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/826,304

Applicant(s)

WU, SHYE-LIN

Examiner

Thomas L. Dickey

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 June 2005.
2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
4a) Of the above claim(s) 1-13 is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 14, 15 and 17-19 is/are rejected.
7) ☐ Claim(s) 16 is/are objected to.
8) ☒ Claim(s) 1-19 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 19 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____

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DETAILED ACTION

Election/Restriction

1. Applicant's election without traverse of Group II, claims 14-19, in the Paper filed 06/20/2005 is acknowledged.

Oath/Declaration

2. The oath/declaration filed on 04/19/2004 is acceptable.

Drawings

3. The formal drawings filed on 04/19/2004 are acceptable.

Priority

4. Applicants have made no claim for priority.

Information Disclosure Statement

5. If applicant is aware of any relevant prior art, he/she requested to cite it on form **PTO-1449** in accordance with the guidelines set forth in M.P.E.P. 609.

The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may

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not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the examiner on form PTO-892 has cited the references, they have not been considered.

Claim Objections

6. Claims 15 and 18 is objected to because of the following informalities:

There is no apparent antecedent basis for "said termination trenches" in claims 15 and 18. From context it is assumed that "termination trenches" refers to the first and fourth trenches previously introduced.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

A. Claims 14, 15, and 17-19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over CHANG ET AL. (20020008237) in view of KOCON (20040256690).

Chang et al. discloses a power rectifier device with an n⁺ substrate 10 having a n-drift layer 12 formed thereon; a cathode metal layer 34 formed on a surface of said n⁺ substrate 10 opposite said n-drift layer 12; an active region (no part #; it is found within

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the range defined by termination region 22) having a metal silicide layer 32 formed thereon; a termination region 22 being defined at positions outer of said active region; an oxide (field oxide. Note, paragraph 17 and in keeping with claim 15, that part of the field oxide above the first and fourth trenches has been removed) layer insulating layer 16 formed on said n-drift layer 12 and on said termination region 22; four first trenches 29 along a line and the second and the third of said trenches 29 formed into said n- drift layer of said substrate 10, and the first and the fourth of said trenches 29 formed into said insulating layer 16 and said n- drift layer of said substrate 10; said active region being defined from a first interval to a second interval, wherein said first interval is in between the first one and the second one of said first trenches 29, and said second interval is in between the third one and the fourth one of said first trenches 29; a thermal oxide layer 14 formed on said termination region 22; an anode electrode 36 formed on metal silicide layer 32 and extended to cover the first and the fourth of said first trenches 29, wherein said anode electrode 36 is Al (a layer selected from Al, AlCu, AlSiCu or a stack layer formed of Ti, Ni, and Ag), and wherein said active region further comprises the first and the fourth of said trenches 29, so that said insulating layer 16 formed thereon is removed and thus said metal silicide layer 32 is formed over four first trenches 29 and said anode electrode 36 is formed extended to cover a portion of said termination trenches 29. Note figure 9 and paragraphs 0016-0022 of Chang et al. Chang et al. does not disclose that the four first trenches are filled with an un-doped polycrystalline silicon layer, or, with regard to claim 18, that the four first trenches further

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comprises an oxide lining formed on a sidewall and bottom of said four first trenches and said first and fourth trenches.

However, Kocon discloses a power rectifier device with four first trenches 210(a)-(d) along a line with an oxide lining 208 formed on a sidewall and bottom of said four first trenches and said first and fourth trenches and filled with an un-doped polycrystalline silicon layer 212 and 214 and 216 and 218 spaced from each other. Note figure 2 and paragraphs 0038-0043 of Kocon. Kocon explains, paragraphs 0041 and 0042, that the undoped polysilicon layers (Kocon refers to them as "charge control electrodes") create an electrical field profile in drift region 204 that is higher and more uniform, and improves charge spreading when the rectifier is turned on. Therefore, it would have been obvious to a person having skill in the art to augment Chang et al.'s power rectifier device with the four first trenches filled with an un-doped polycrystalline silicon layer and further comprising an oxide lining formed on a sidewall and bottom of said four first trenches and said first and fourth trenches such as taught by Kocon in order to create an electrical field profile that is higher and more uniform, and improves charge spreading when the rectifier is turned on to thus provide a higher breakdown voltage and better on-resistance.

Allowable Subject Matter

8. Claim 16 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

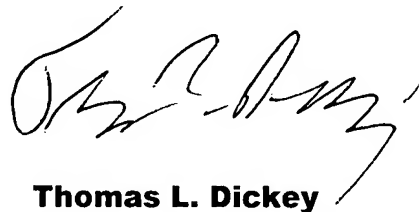
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Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas L Dickey whose telephone number is 571-272-1913. The examiner can normally be reached on Monday-Thursday 8-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Thomas L. Dickey
Patent Examiner
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07/05